

Headquarters U.S. Air Force

Integrity - Service - Excellence

Condition Based Maintenance Plus (CBM+)



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HAF/A4ID
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Version 2.0**



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Agenda

- **CBM+ USAF Overview**
- **CBM+ Initiative Governance (Not just for CBM+)**
- **Enterprise CBM+ Initiatives (People, Process, and Technology)**
 - **Systems Lifecycle Integrity Management (SLIM)**
- **CBM+ Policy in the USAF (Backup)**



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CBM+ Organizational Construct and Initiative Governance

- **There's no organization specifically charged with minding the "CBM+ Store"**
 - **DoDI compliance left largely up to System Program Management Office**
- **Utilizes Enterprise Logistics Governance (ELG) Processes to energize discussions, address gaps, and transform within the USAF Logistics Enterprise**
 - **HAF/A4ID Transformation**
 - **CBM+, CBM+RE, HVM, PTC, Policy, RUL.....**
 - **CBM+ is policy driven through Policy (Acquisition and Mods)**



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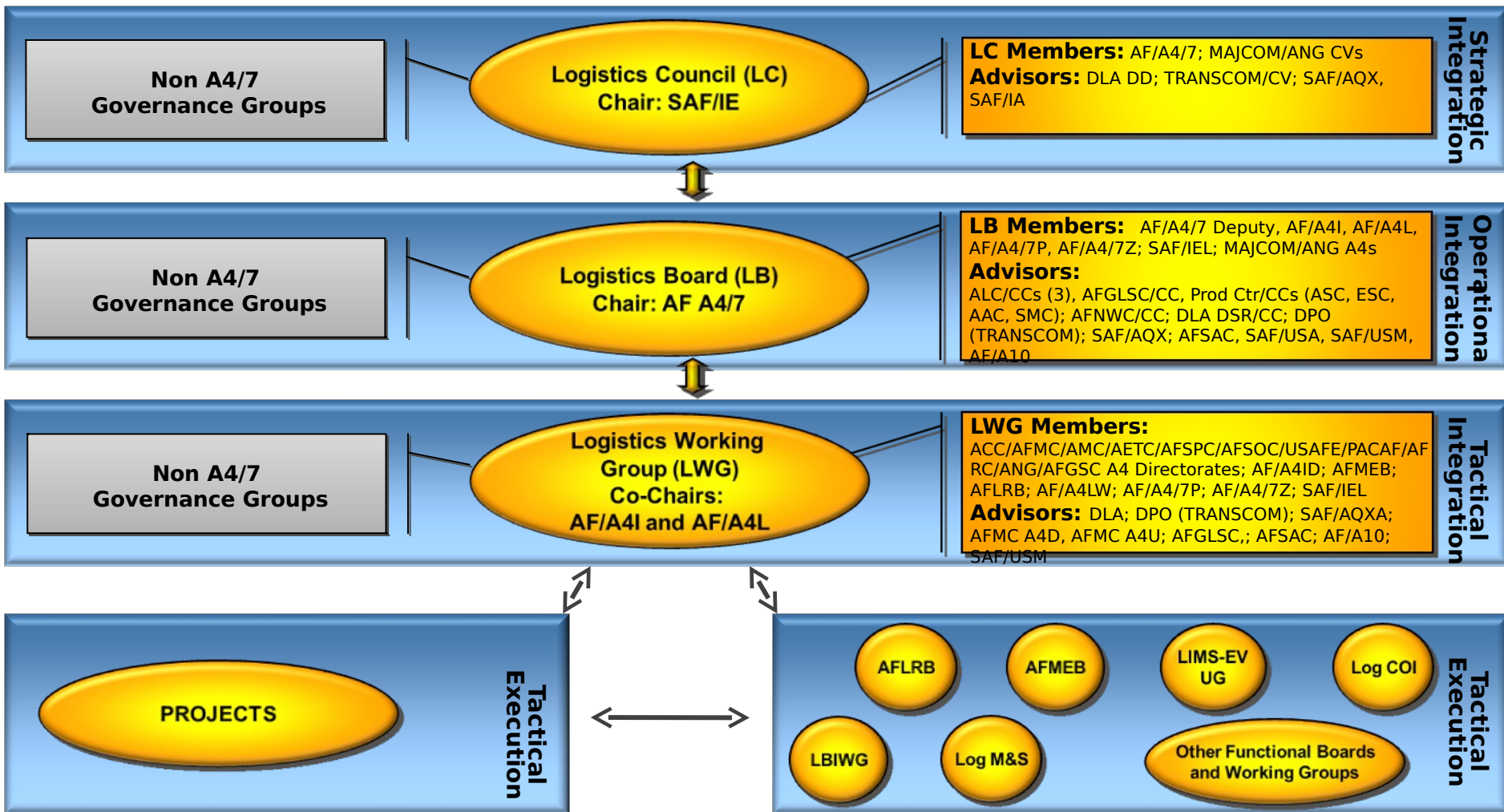
ELG -Purpose

- **Permanent governance structure providing logistics community standardized consolidated guidance/decisions across**
- **Goals:**
- **Streamlined decision making and problem resolution**
- **Improved integration:**
 - **Among eLog21 and other major logistics improvement efforts**
 - **Across SAF, HQ, MAJCOM, ALC, and DRU**
 - **Continuous Process Improvement (CPI) mode**
 - **Internal - external to logistics**
- **Better use of senior leader time - reduce the number of meetings or boards they must attend**



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Tiered ELG Structure

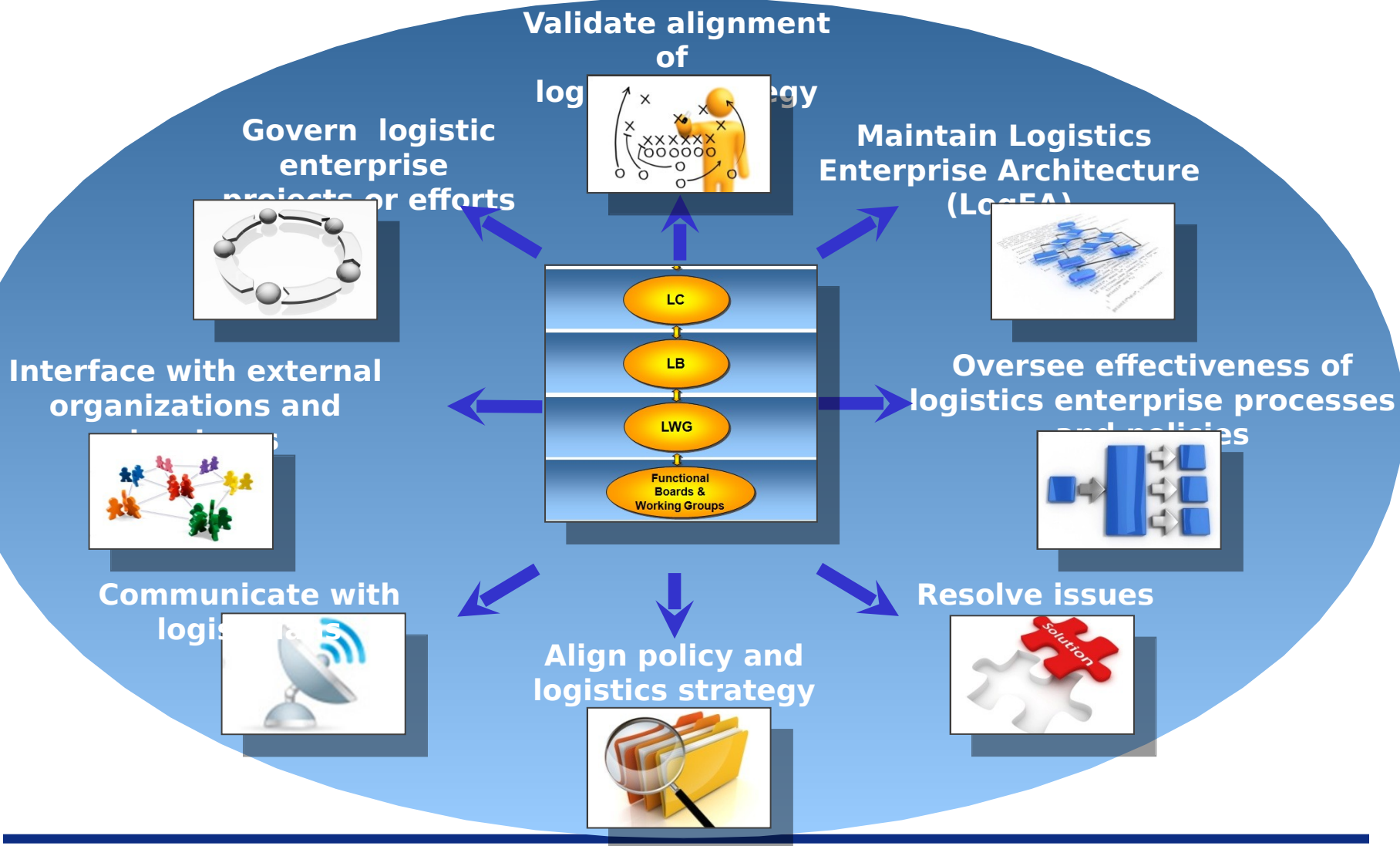


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Objectives of ELG


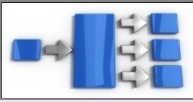
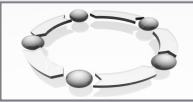






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Examples of ELG Decisions by Tier

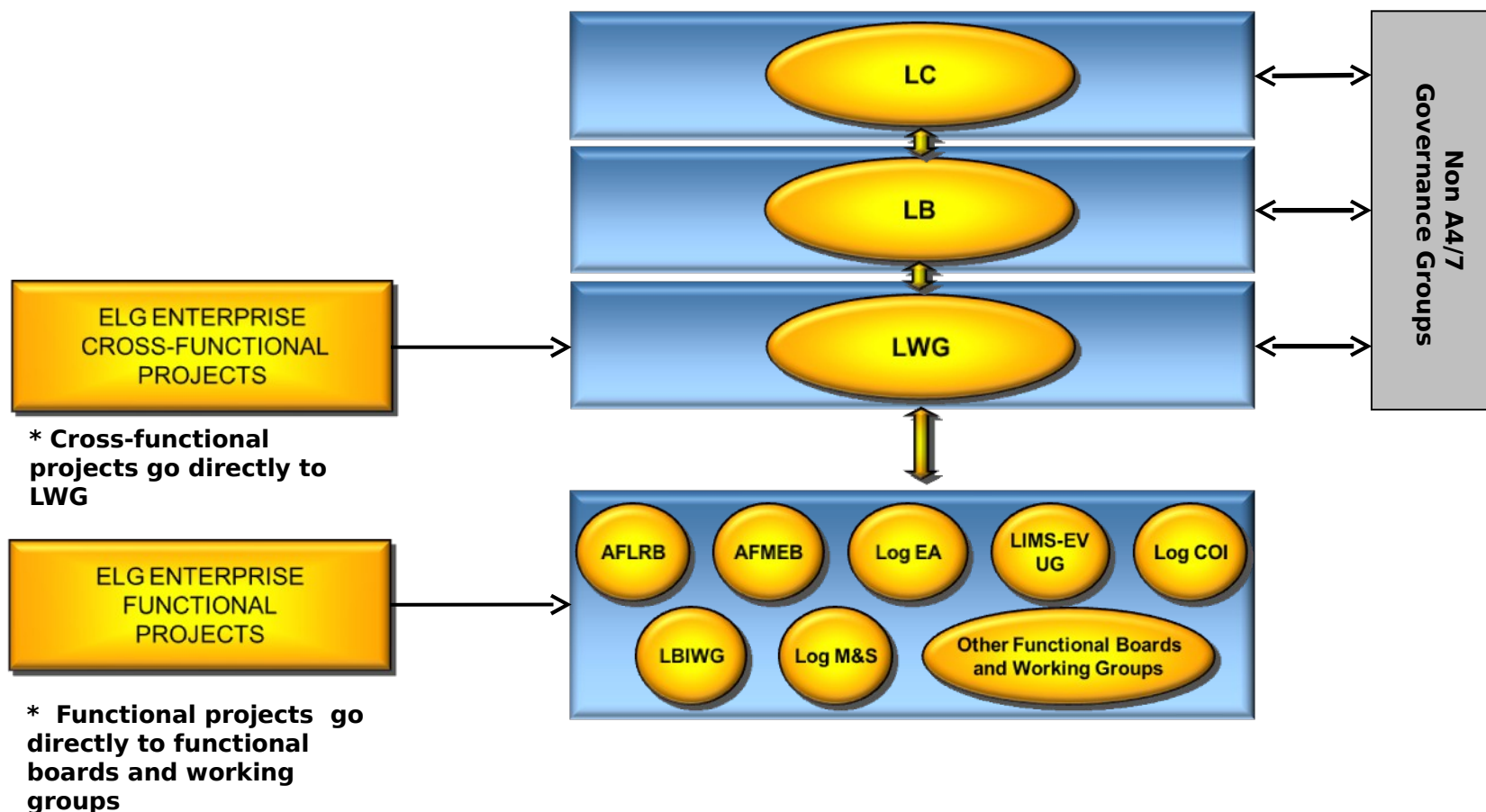
		Governance Tier		
		Logistics Working Group (LWG)	Logistics Board (LB)	Logistics Council (LC)
Decisions	Strategy	 Provide strategy change recommendations and maintain alignment w/ DOD and AF	Validate and change logistics strategy to align w/ DOD and AF	N/A
	Enterprise Processes	 Review effectiveness and facilitate adoption of enterprise logistics processes	Direct adoption of standard, enterprise logistics process (e.g. AFSO21 improvements)	Direct adoption of standard, enterprise logistics process (e.g. AFSO21 improvements)
	Logistics Enterprise CPI Projects	 Approve further analysis and recommend closure for logistics enterprise projects or programs	Approve, prioritize, oversee and direct or approve closure of enterprise projects or programs	Approve new enterprise-level projects or programs (for efforts with strategic impact)
	Policy	 Recommend policy changes to appropriate functional authorities	Recommend the codification of enterprise wide standard process	Direct updates to policy
	Issue Resolution	 Prioritize issues for either resolution or elevation	Prioritize issues for either resolution or elevation	Resolve issue with strategic impact
	External Organizations	 Maintain touch points to review and assess changes and deconflict with external communities	Maintain touch points to review and assess changes and deconflict with external communities	Direct the review and assessment of changes to external process for logistics impact
	Communication	 Communicate benefits of ELG and direct creation of change management plans	Champion ELG decisions and communicate them	Champion ELG decisions

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ELG Project Flow and Oversight



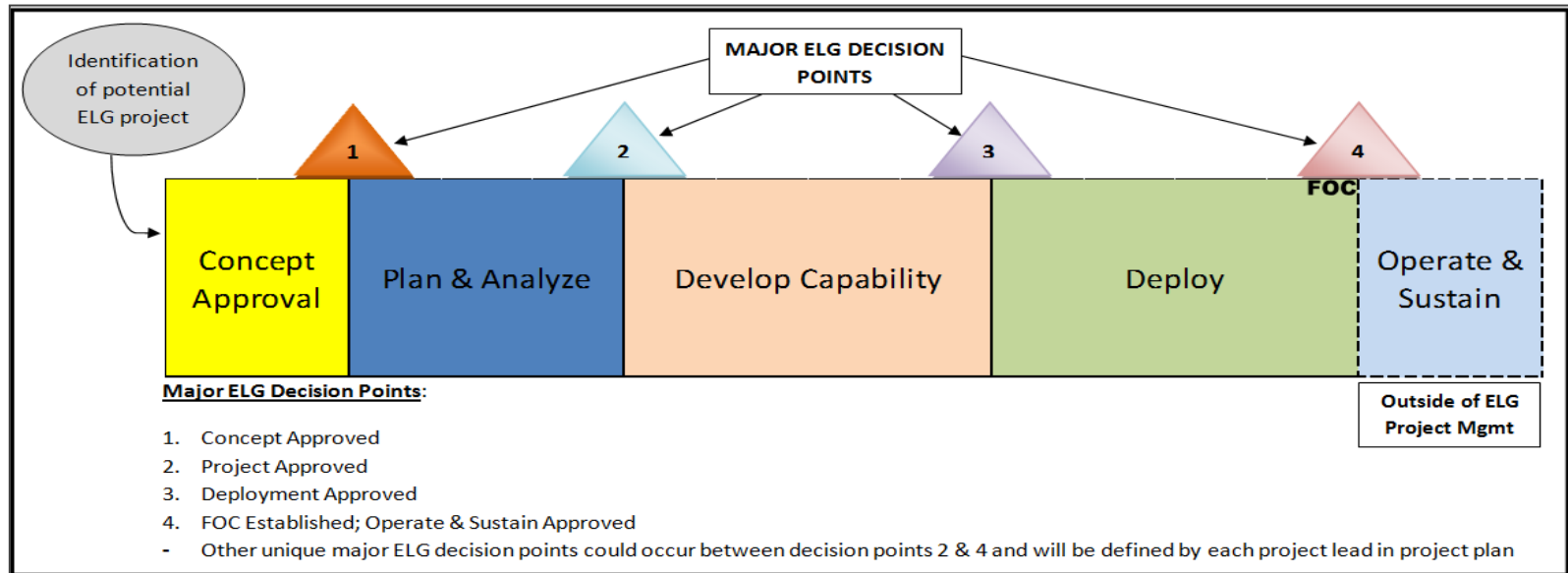
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ELG Project Lifecycle

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- ELG governed projects complete standard work and adhere to a common project management lifecycle
- Benefits include:
 - 8-step problem solving process
 - Interdependency identification and management process
 - Project status requirements





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Enterprise CBM+ Related Initiatives

People

- **CBM+ Module in LOG 135 educational course (HAF/A4ID-SLIM Initiative)**

Process

- **SLIM Guide and Acquisition Sustainment Toolkit Checklist promotes CBM+ Requirements (HAF/A4ID-SLIM Initiative)**
- **AF Service Representative on OSD CBM+ Advisory Group (HAF/A4ID-SLIM Initiative)**
- **High Velocity Maintenance (HVM) at Warner Robins Air Logistics Center (WR-ALC)**

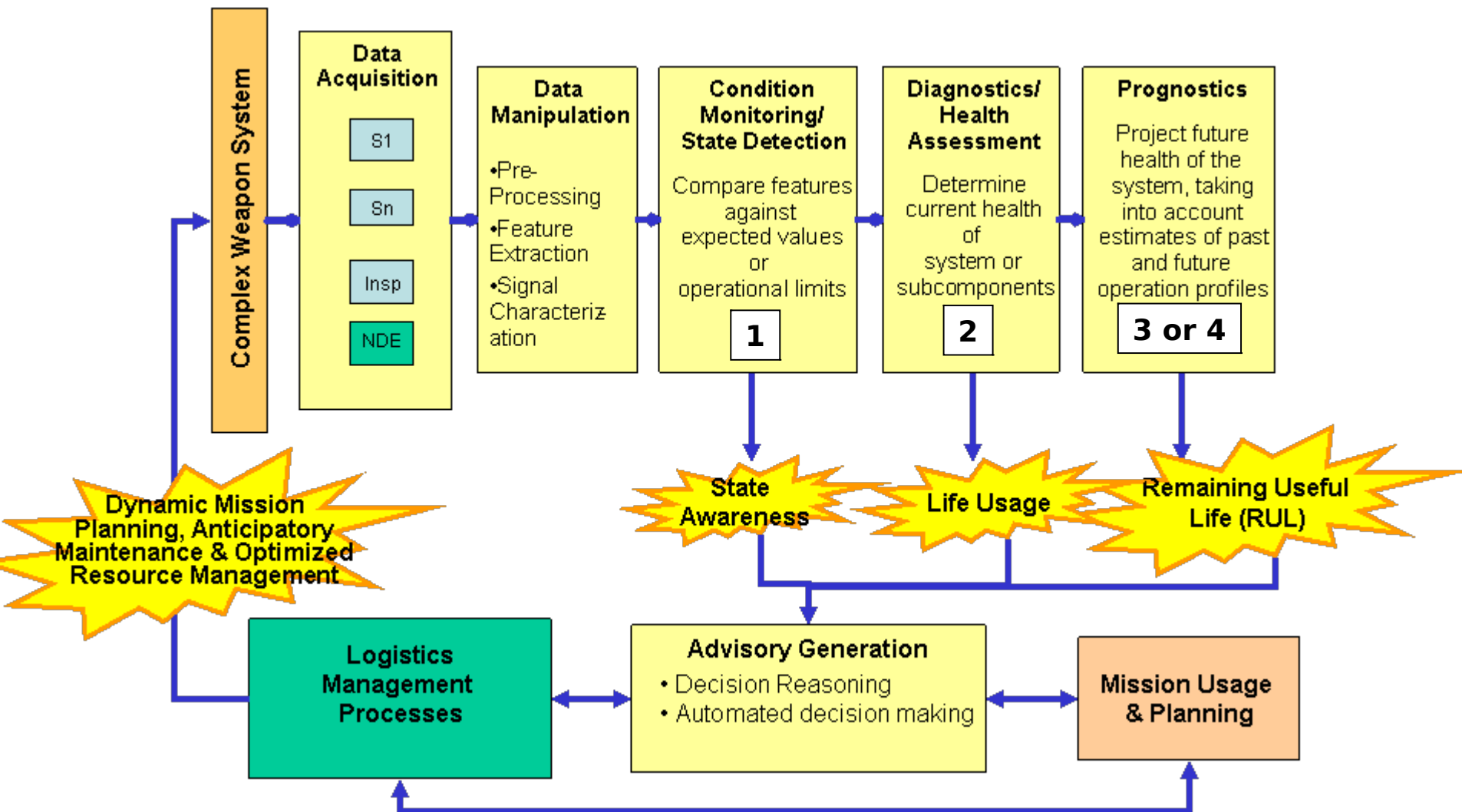
Technology

- **Logistics and Installations Management System-Enterprise View (LIMS-EV)**
 - **Multiple Condition Report Views (LIMS Program Office)**
 - **Engineering Technical View (HAF/A4ID-SLIM Initiative)**
- **Condition Based Maintenance Plus Research Environment (CBM+ RE) (HAF/A4ID-SLIM Initiative with AFMC/A4U-Sustainment Engineering)**



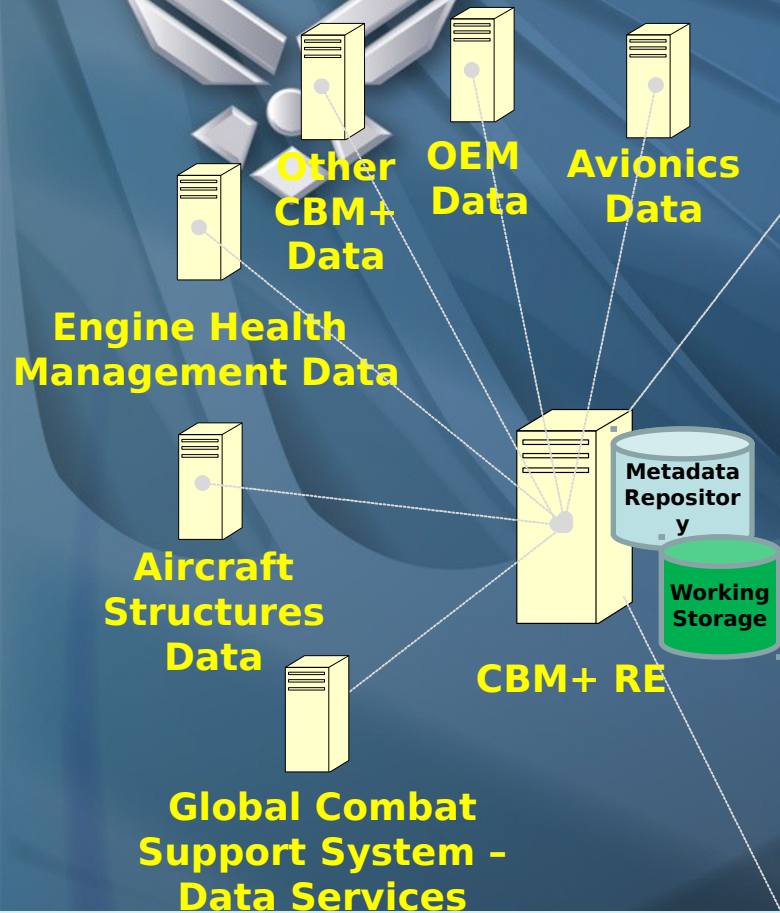
USAF CBM+ Framework

AFSO21 DSWS Initiative (SCO-1-19) (SLIM)



Multi-source, near real time data vs single source batch aggregation requires SOA and Federation

Condition-Based Maintenance Plus Research Environment (CBM+ RE)



Attributes:

- Federated Architecture
- Standard Data Exchange
- Single Point Entry and Security Verification
- Supports Spiral Development of CBM+

Multi-Use Support Capability

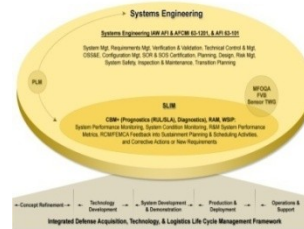


RESEARCH

- Access to pedigreed data
- Validate research results
- Shorten development/insertion cycle time



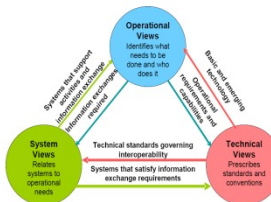
System Integrity Management



- Support collaboration of engineering tools
- Improve system performance monitoring and assessment
- Proactive lifecycle weapon system



ENTERPRISE INTEGRATION



- Integrated architectures define information exchange requirements
- Links platforms and logistic enterprise

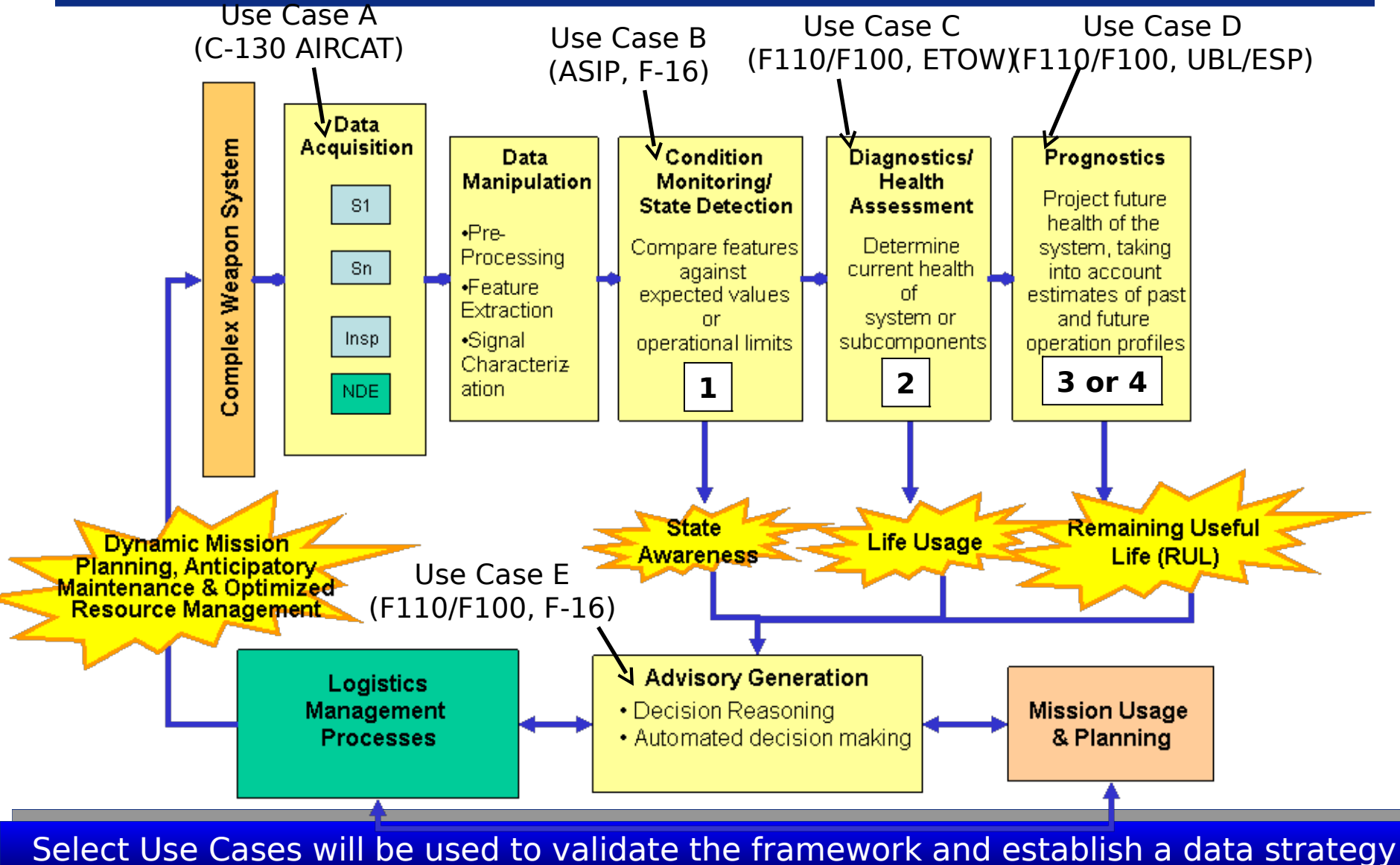




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USAF CBM+ Framework

AFSO21 DSWS Initiative (SCO-1-19)





CBM+RE Major Functionalities



- Resource Discovery Application
- Engineering Model Mashup



Resource Discovery Application

- A web application providing a rich and intuitive user experience to subject matter experts for searching and displaying both static and dynamic enterprise resource links
- Built on top of the MDE Information Asset Discovery, it will leverage the vocabulary repository to drive ad hoc data



Federation **Propulsion** **Structures** **Avionics**

es [Advanced Search](#)

821012 F ASIMIS - last update=null file id=821012 file type=XML number of records=40 tms=F16 package name=null downloadformat=null modified=false XML	Related Concepts: Engine Serial Number Base* ASN* Flight Count* Alt Baro AOA SRAN* CETADS null modified=false MAJCOM* * = can provide values as part of search
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F110-100 RESULTS SYB.SHD
CETADS - last update=2008-05-14
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What is an Engineering Model Mashup?

- **Web application that provides aggregation, transformation, and computational services over top of the data exposed by one or more sources.**
- **It focuses on run time development, drag-and-drop, and Subject Matter Expert empowerment.**



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What an Engineering Mashup Provides

- **Aggregation and Transformation of engineering data to provide new reusable data sources**
- **Uploading and Execution of 3rd party algorithms**
- **3rd party intellectual property assurance**
- **Testing on live data**
- **WSDL Interrogator (Support dynamic service call)**
- **Credential proxy for data assurance**
- **Parallel processing**
- **Results of analysis that can be reused across the AF enterprise**



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CBM+RE Capabilities and Topics

- **Server Architecture**
- **Federated Security**
- **CBM+RE Major Functionalities**
- **SOA Framework Maturation**



CBM+ Policy in the USAF

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- **USAF is compliant with DoD policy**
- **USAF Policy hierarchy: AFI - AFM - AFMCI (MAJCOM) - Organizational Instructions (e.g. Air Logistics Center)**
 - **AFPAM = guidance**
- **USAF Policy Updates**
 - **Air Force Instructions in revision / updates pending**
 - ***AFI 21-101 Aircraft and Equipment Maintenance Management***
 - ***AFI 63-1201 becoming AFI 62-101 Systems Engineering (updates 63-1201 Life Cycle Systems Engineering)***
 - ***63-101 Acquisition and Sustainment Life Cycle Management***
 - **Update Released 12 Jan 2012 - New AFI 20-115 Propulsion Management for Aerial Vehicles (Replaced AFI 21-104)**
 - **NEW - AFI 20-101 on Product Support in work, CBM+/RCM unknown**



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Back Up Slides



CBM+ in Current USAF Policy

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Policy	Sec/Para	Topic	Office/OPR/Topic	CBM+	Notes
AFI 63-101	2.16.6	Roles	A4/7	X	Ensure Condition Based Maintenance Plus (CBM+) concepts and functions are developed and implemented as applicable.
AFI 63-101	2.19.28	Roles	AFMC/CC	X	Ensure Serialized Item Management (SIM), Reliability Centered Maintenance (RCM) and Condition Based Maintenance Plus (CBM+) concepts and functions are developed and implemented as applicable.
AFI 63-101	2.21.18	Roles	AFSC/CC	X	Ensure SIM, RCM and CBM+ concepts and functions are developed and implemented as applicable
AFI 63-101	2.29.9	Roles	Program Mgr/SPM	X	Develop and implement, as applicable, Condition Based Maintenance Plus (CBM+) functions.
AFI 63-101	3.88.6	Sustainment Planning Requirements	Product Support/Sustainment Planning Overview	X	Condition Based Maintenance Plus (CBM+), as an extension of the maintenance design program executed during development, shall be used to improve maintenance agility and responsiveness, increase operational availability, and reduce life cycle total ownership costs. The goal is to perform maintenance only upon evidence of need by employment of technologies, processes, and procedures to improve maintenance/logistics. Enabling technologies and concepts include prognostics, diagnostics, portable maintenance aids, interactive electronic technical manuals, interactive training, data analysis, integrated information systems, automatic identification, reliability-centered maintenance, and joint total asset visibility. See DODI 4151.22, Condition Based Maintenance Plus (CBM+) for Materiel Maintenance, for more details
AFI 63-101	3.96	Sustainment Planning Requirements	Support Equipment/Automatic Test Equipment	X	Application of standardized Support Equipment/Automatic Test Systems (SE/ATS) is preferred to provide efficiency and reduce cost. The PM shall minimize the proliferation of system-unique equipment at all levels while ensuring the maintenance and deployment requirements of existing and developing systems are met



CBM+ in Current USAF Policy

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Policy	Sec/Para	Topic	Office/OPR/Topic	CBM+	Notes
AFI 63-107	1.4.3.2	Product Support Strategy Requirements		X	Condition-based maintenance plus (CBM+), reference: DoD Maintenance Policy, Programs and Resources, is an initiative to improve maintenance agility and responsiveness, increase operational availability and reduce life-cycle total ownership costs. The goal of CBM+ is to perform maintenance only upon evidence of need. Condition-based maintenance (CBM) is a set of maintenance processes that rely on a real time assessment of weapon system condition generated by embedded sensors and/or external tests and measurements using portable equipment, CBM+ expands on these basic concepts by employing other technologies, processes and procedures to improve maintenance/logistics. These existing and future technologies, processes and procedures are to be addressed during all phases of a weapon system's life cycle planning, acquisition, sustainment and reclamation.
AFI 63-107	1.4.3.2.1	Product Support Strategy Requirements		X	The enabling technologies and concepts that constitute an acceptable initial AF baseline for achieving CBM+ implementation are: prognostics, diagnostics, portable maintenance aids, interactive electronic technical manuals, interactive training, data analysis, integrated information systems, automatic identification, reliability-centered maintenance (RCM) and joint total asset visibility (JTAV)
AFI 20-115		Propulsion Management for Aerial Vehicles			Condition Based Maintenance Plus (CBM+). CBM+ concepts shall be used to optimize key performance measures of engine readiness, availability, reliability, mean downtime, and ownership costs. Reference DODI 4151.22, <i>Condition Based Maintenance Plus (CBM+) for Materiel Maintenance</i> and AFI 63-101, <i>Acquisition and Sustainment Life Cycle Management</i> . Engine Health Management (EHM). EHM shall be implemented on propulsion assets. EHM is the application of CBM+ concepts to aircraft engines and implementation may vary depending on the TMS support concept, MAJCOM requirements, and data availability. The goal of EHM is to tie together ET&D and RCM to enable a predictive maintenance end state capability. Refer to or reference TO 00-25-257-CD-1, <i>Technical Manual - Engine Health Management Plus (EHM+) General Information User Manual</i> for additional direction and/or guidance.
AFMCI 63-1201	A2.8.2			X	The overarching support concept should be considered from the start of any development or modification effort. Support concepts like condition based maintenance will drive requirements and design decisions. Early ALC representation in development of the support concept and related requirements is necessary to reduce total ownership costs.



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CBM+ in Current USAF Policy

(continued)

<u>Policy</u>	<u>Sec/Para</u>	<u>Topic</u>	<u>Office/OPR/Topic</u>	<u>CBM+</u>	
AFPAM 63-128	2.11.21.5	Life Cycle Management Plan: Program Performance/System Indicators and Requirements		X	Describe your maintenance and inspection program; include the methodology basis (Conditioned Based Maintenance Plus (CBM+), Reliability Centered Maintenance (RCM), and/or Maintenance Steering Group III (MSG-3). Describe the relationship of the RAM approach with other related program efforts such as Weapon System Integrity Programs (WSIP), Aircraft Information Program (AIP), and Military Flight Operations Quality Assurance (MFOQA) Program
AFPAM 63-128	3.7.13	LCS: Maintenance Planning and Management		X	Define requirement for maintenance data collection. Technical Order 00-20-2 provides a broad understanding of the objectives, scope, concept, and policy of Maintenance Data Documentation (MDD) and some intended uses of the data collected. Define what is to be collected (failure, availability, maintenance) and when it should be reported (IOC, turnover, etc.). Define how and where to report data. Integrated Maintenance Data System (IMDS) is the approved Air Force Base Level MDD system and Reliability and Maintainability Information System (REMIS) is the approved Depot Level MDD system.